PROGRESS REPORT
For
VERSATILE, HIGH PRECISION STEREO
POINT TRANSFER DEVICE

Period Covered:	April 1965
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OBJECTIVE ASSEMBLY

Test and debugging have been principle work in this area in a companion viewer.

The rebuilt zoom magnifier feedback potentiometers have been received, tested and installed in the system. Improvement has been seen where channel stepping motor frequency correspondence error should be close to 5% through most of the system magnification range. Further tests will be conducted in May to verify tracking correspondence over a wider range of controls variables.

Improvement in tracking error has been seen by using optical means to set up channel magnification ratios. Previously, dial settings were used for magnification adjustment, but dial inaccuracies to 10% in some settings were observed.

Dot reticle flare has been significantly reduced by addition of a field stop at the dot image plane. Dot brightness has been increased by changing lamp position and raising lamp socket voltage to slightly above rated voltage, making possible to see dot with open gate through most of the high intensity lamp brightness range.

Color "fringing" noticed in 30x - 128x range is due to chromatic aberrations in the 10x Wild Fluotar lens used. This defect is quite noticeable when field is restricted to normal microscope use. However, the lens does give a brighter image and slightly more resolution on axis. In addition, the Fluotar will have to be used on Point Marking Optics because of its large N.A. An alternate lens studied has been the Leitz 10x, .25 N.A. microscope objective that offers some improvement in marginal chromatic aberrations, a lower brightness image and slightly reduced resolving power. In addition, this lens required modifications to pro-

vide clearance for the center holddown mechanism at the loop forming slot.

Anti-vignetting filter has been experimentally made for the lowest magnification range with approximately 50% brightness reduction at the center, and a significant improvement in uniformity. Since photographic film type filters used here gave a noticeable amount of diffusion to image, we are now getting quotations for evaporated filters on glass.

Poor contrast noticed has been investigated and little improvement has been made here. A number of steps have been taken; many areas have been painted with 3M Black velvet to control reflections, lenses and mirrors have been cleaned. Continued tests and experimental work will be required to bring much improvement here.

IMAGE ENHANCER

Residual imperfections noticed in the imagery are due to extended rather than random imperfections in fiber optics cable. The circular enhancing scanning motion only reduces defect contrast when there are a large number of perfect fibers to integrate image information. The extended defects inherent with the present large cross section fiber optics cables not only provide fewer perfect conducting fibers to aid the integrating process, but the multifiber technique yields larger defects than a unit fiber. Unless relatively large scanning radius is chosen, with accompanying field reduction and optical and scanning geometry complications with thicker wedges, the present enhancing scheme's success appears to be limited to results seen.

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EYEPIECE ASSEMBLY

Brightness attenuation filters and horizontal strabism adjustments have been added to each channel in the eyepiece assembly.

Three Wratten neutral density filters, with 50%, 25% and 13% transmission respectively, can be added independently, or in any combination to each image channel. Knobs on each side of the eyepiece assembly control filter position: "out" for out of path, "in" for insertion for selected brightness reduction. Filters are axially positioned about midway between fiber optics cable and its collimating lens to minimize effects of dirt and filter defects. A nameplate on the cover identifies filter attenuation and related knob.

The eyelens station has been reworked to provide a horizontal strabism adjustment, permitting both divergence control of the eyelenses and a wider range interpupillary adjustment. The eyelenses are now mounted in a pivoted block whose axis of rotation is parallel to eyelens axis, and pivot axis is located above the eyelens. A motion of ± approximately 4 degrees of axis shift is provided. A thumb screw locks block in position.

Because of the independent motions now built into the eyestation, a different readout means had to be designed for the interpupillary distance. The sum of readings of two scales now will indicate the interpupillary distance: One scale measures the distance between the pivot axis of the eyelens blocks while each block has another scale giving the change in the exit pupil spacing from the pivot axis scale. The combination allows a readout for a range of 52 to 73 millimeter exit pupil spacing for the currently used 4.5x eyelens. At the same time, the pivoting blocks permit operator to adjust the convergence to the dot reticle and field of view for his comfort at any interpupillary setting available at eyestation.

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SCANNING DRIVE

Much study and work has been done to reduce system vibration during scanning drive operation. Principle efforts have been centered around addition of inertia to drive at gearbox input, reduction of spring rate in damper springs, addition of friction to damper and addition of plastic inserts to reduce noise and increase life of vibrating damper members. The result has been a significant reduction of noise and image degradation during scanning. A few vibration peaks remain through the frequency range, but greatly attenuated in amplitude.

In an effort to provide a more reliable master switch for the joystick, a high sensitivity switch with a specially built actuator has replaced one discussed in the joystick assembly. This combination has a smaller differential between starting and stopping frequencies, allowing greater operating point drift between direction sensing and master switches. Another important feature gained is a large reduction in switch operating forces with attendant null seeking improvement. To get the above gains, extremely critical switch adjustment and tight overtravel control made necessary an actuator with several types of fine adjustments.

VACUUM FILM HOLDDOWN

To simplify film loading and improved ruggedness, the rear manifold has been redesigned and rebuilt. The new approach makes the rear member a spring loaded transparent plastic holddown rather than a manifold with little adverse influence on film flattening and assures low pressures needed to exhaust air bubbles under film. The timers previously used appear unnecessary. Film loading is much less difficult as film is pushed under the holddown's edge since it rests on the glass platen. Since transparent plastic holddown edge is now 1/8 inch thick, it can withstand rougher handling than the previous design.

The pneumatic film looping slot holddown has received attention, replacing plastic foam with a thin metal spring member to assist seals across film width.

Platens with polished macrogrooves have not been received, but have been promised for mid May delivery.

EYEPIECE ASSEMBLY SUPERSTRUCTURE

Elevation screw drive now has a 3:1 gear reduction, replacing the 1:1 previously used. With this change, the vertical adjustment of the eyelens is made easier with less shaking of superstructure during rapid cranking.

FILM DRIVE

Heavier springs have been added to eliminate gear slippage and damage during acceleration of heavy spools or operation when spools are locked because of machine friction interlock.

Work for the Next Reporting Period

1. Complete scanning drive, mechanical and electric modifications.
2. Obtain experimental glass platens for vacuum holddown installed and evaluated.
3. Design, fabricate and install ruggedized vacuum manifold and plumbing changes.
4. Complete optical debugging.
5. Complete system debugging.

Attachments:

1. Customer Review (Meeting of 4/15/65(#552A - CD-109
2. Financial Report

ATTACHMENT 1 to 552 - OD-249

16 April 1965
552A - CD-109
WWB:rf

CUSTOMER REVIEW

1) Dot reticle flare extent dependent on zoom magnification and reticle size setting. Brightness appears down from previous visits.

2) Color fringe noticed on 30-128 X range.

3) Vacuum leak - right channel.

4) Eyelens diverge too greatly at minimum interpupillary distance setting. Cannot get minimum setting of 55mm required. See no objection to proposed [redacted] strabism adjustment.

5) Vignetting, especially objectionable in lowest magnification range and at all lowest zoom magnification settings. RN suggests:

   a) Gaussian filters by [redacted] for solution.

   b) Visit by [redacted] for possible correction of eyelens problem.

6) Scanning drive vibration shakes image and equipment very badly.

7) Would like disconnect or silencing of counter.

8) Film guides compromised by torn film edge. Customer has no objection for their repair of film.

9) Film drive appears acceptable if occasional sticking and gear slippage is eliminated.

10) Need improvement in loop forming mode (limit switch).

11) Light and color scattering around field of view.

12) Poor correspondence in uncoupled mode found objectionable. RN suggests:

   a) Master switch scheme now installed.

   b) Get system optimized for near 5% Maximum error.

STAT

13) Contrast poor in zoom ranges. Possibly flare (see #2)

STAT 14) Dirt in [redacted] field lens.

15) Prefer polished hard surface against film for loop forming slot holddown. Do not need rotating rollers.

16) Residual imperfections noticed on enhanced fiber cable image, especially in left channel.

17) Can counterbalancing or gear reduction of Z axis reduce effort in raising eyepiece assembly.

18) Interested in proposal for flicker retrofit in superimposed mode.

19) 1/2, 1/4, 1/8 attenuation filters would be acceptable in eye-piece assembly.